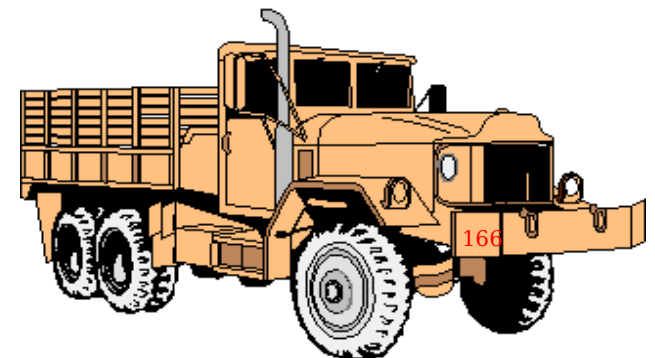
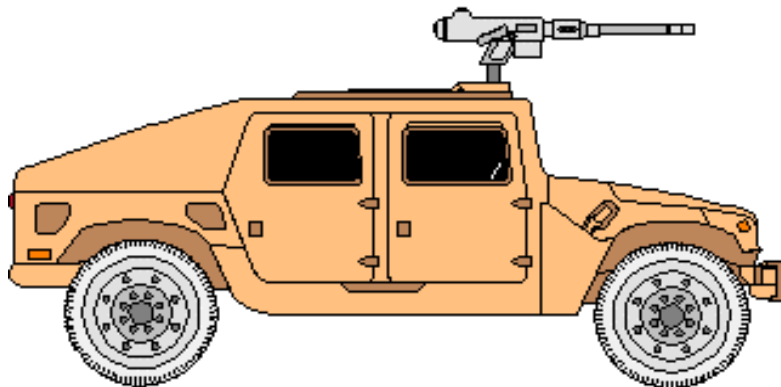
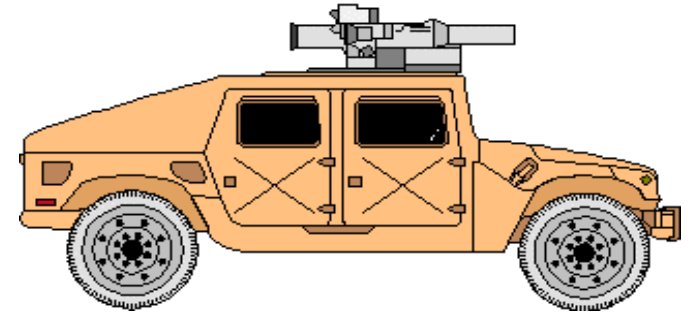


# NIGHT VISION



# OUTLINE

- Purpose
- Introduction
- NVG Description
- General Characteristics
- Types of NVG's
- Night Operations
- Types of Vision
- Visual Problems Affecting Night Vision

# OUTLINE (cont'd)

- Dark Adaptation
- Night Tactical Precautions
- Viewing Characteristics
- Diminishing Effects
- Debilitating Effects
- Self Imposed Stress
- Ambient Light
- Determining Speed

# OUTLINE (cont'd)

- Night Vision Scanning Techniques
- Causes of Emergencies
- Driver Responsibilities
- Assistant Responsibilities
- Accountability and Security
- Tube Defects
- AN/PVS 5C

## OUTLINE (cont'd)

- AN/PVS 7B
- Harness Assembly
- Questions

# PURPOSE

- Familiarize students with NVG's.
- Train student drivers and co-drivers to sa  
with NVG's

# NVG DESCRIPTION

## **WHAT ARE NIGHT VISION GOGGLES**

- Night vision goggles are devices that make an object more visible during periods of low light levels.
- Their performance is directly related to the amount of ambient light available.

## GENERAL CHARACTERISTICS

- Single-color viewing
- Monochromatic adaptation
- Dark adaptation
- Spatial disorientation



## GENERAL CHARACTERISTICS

# SINGLE COLOR VIEWING

- Objects viewed through the NVG's will appear green
- NVG's do not provide for color discrimination
- Dark areas will appear black and light areas will appear white
- Shadows are difficult to distinguish from puddles of water, walls ditches, and vice versa when viewed through goggles at night

# MONOCHROMATIC ADAPTATION

- Monochromatic (one color) adaptation happens upon reentering a high ambient light environment
- You may experience a tint or discoloration of objects viewed with the unaided eye
- This is a normal reaction
- Causes no discomfort and disappears in about 2 minutes

## GENERAL CHARACTERISTICS

# **SPATIAL DISORIENTATION**

- Dizziness and nausea may be caused by
- Driving with one tube focused inside the vehicle and the other focused outside the vehicle when wearing the AN/PVS 5 series goggles
- Use your assistant driver to help you with objects inside the cab of the vehicle
- Night vision goggles are image-intensification devices that improve visibility in low light levels

## GENERAL CHARACTERISTICS

### **SPATIAL DISORIENTATION (cont'd)**

- They amplify available ambient light, such as moon light, star light, and artificial light
- NVG's do not magnify an image
- Objects that are hard to see during the day are also hard to see at night through the goggles
- NVG performance is directly related to the amount of ambient light
- Visual acuity (the accuracy with which an object is seen) with NVG's will never be as good as it is with the naked eye during daylight conditions

# TYPES OF NVG's

- The AN/PVS 5's and the AN/PVS 7's are the two goggles primarily used by the military
- 3 types of 5 series goggles. The 5A, 5B, and 5C
- There are 2 types of 7 series goggles. The 7A, and 7B
- Both series of goggles can be operated in temperatures from 113 to -60 degrees

# NIGHT OPERATIONS

- Vision is the most important sense you use while driving
- It is the sense that makes you aware of the position of your vehicle in relation to the road
- You need good depth perception for determining height and distance
- Good visual acuity for identifying terrain features and obstacles

# TYPES OF VISION

- PHOTOPIC-----Daylight Hours
- MESOPIC-----Dawn, Dusk, Mid-I
- SCOTOPIC-----Night Time

# TYPES OF VISION

## **PHOTOPIC VISION**

- Photopic vision is used during daylight hours or when a high level of artificial light exist, such as here in the classroom



# TYPES OF VISION

## **MESOPIC VISION**

- Mesopic vision is used at dawn, dusk, and during periods of mid-light levels
- A reduction in color vision and visual acuity occurs as the light level decreases

# TYPES OF VISION

## **SCOTOPIC VISION**

- Scotopic vision is used when low-level light conditions exist, such as at night
- Visual acuity decreases to 20/200 or less and total loss of color vision occurs

## VISUAL PROBLEMS AFFECTING NIGHT VISION

- PRESBYOPIA
- NIGHT MYOPIA
- ASTIGMATISM

## VISUAL PROBLEMS AFFECTING NIGHT VISION

### **PRESBYOPIA**

- The inability of the eye to focus sharply on nearby objects, resulting from hardening of the lens
- Presbyopia is common in individuals over 40 years of age

## VISUAL PROBLEMS AFFECTING NIGHT VISION

### **NIGHT MYOPIA**

- A visual defect in which distant objects appear blurred (nearsightedness)

## VISUAL PROBLEMS AFFECTING NIGHT VISION

# **ASTIGMATISM**

- A refractive defect of the lens that prevents focusing of sharp, distinct images

# DARK ADAPTATION

- This is the process by which your eyes increase their sensitivity to low light levels
- Maximum dark adaptation is reached in about 30-45 minutes
- Exposure to a flare or lightning may require 5-45 minutes for night vision recovery
- It takes about 2 minutes to return to dark adaptation after using NVG's

## NIGHT TACTICAL PRECAUTIONS

- Avoid areas of high intensity light
- Never use your headlights or 4-way flashers
- Know your route
- Quickly warn other traffic in cases of emergency by using your tactical flashlight or Chem-light
- Understand the limitations and capabilities of the NVG's



## VIEWING CHARACTERISTICS

- The field of view with the NVG's is 40 degrees, compared to 200 degrees unaided
- NVG's decrease depth perception at distances less than 20 feet or greater than 500 feet
- The focal range of NVG's is 10 inches to infinity

# DIMINISHING EFFECTS

- Rain
- Fog
- Snow
- Smoke
- Pollution
- Clouds
- Dust

# DEBILITATING EFFECTS

- Street lights
- Airplane lights
- Automobile lights
- Flares
- Spot lights
- Dash lights
- Matches or lighter
- Blackout drive and marker lights

# DEBILITATING EFFECTS

- NVG compatibility is best achieved by eliminating all interior and exterior light sources
- Tape lights that cannot be controlled to reduce the amount of light they emit
- Instruments and gauges can normally be read with NVG's without instrument lighting
- Gauges can degrade the performance of the NVG's

# DEBILITATING EFFECTS

- Blackout drive and markers are not needed to operate a vehicle while using NVG's
- Viewing an area lit by artificial light, such as flares or street lamps will limit your ability to see objects outside the lighted area
- Operating the goggles while staring at a bright light source at night will cause damage to the tubes

# SELF-IMPOSED STRESSES

- Smoking
- Alcohol
- Fatigue
- Nutrition
- Physical conditioning
- Sleep

# SELF-IMPOSED STRESSES

- **SMOKING:** The smoker effectively reduces 20 percent of his/her night vision ability at sea level.
- **ALCOHOL:** This impairs both coordination and judgment.
- **FATIGUE:** When you are tired, you are not mentally alert. Fatigue will slow down your response to night situations that require immediate reaction.

# SELF-IMPOSED STRESSES

**NUTRITION:** Hunger pains lead to distraction and a shortened attention span. Failure to eat foods that provide sufficient vitamin A (eggs, cheese, and carrots) can reduce night vision.

**PHYSICAL CONDITIONING:** You should exercise daily.



# SELF-IMPOSED STRESSES

- **SLEEP:** Night driving is more tiring and stressful than day driving. Therefore, it is important to get enough rest and sleep before driving.

## SOURCES OF AMBIENT LIGHT

- Moon
- Background lighting
- Artificial lights
- Solar light

## SOURCES OF AMBIENT LIGHT

- The moon is the best source of ambient light
- Light from the moon is brightest when it has reached its highest point in the sky
- Schedule training on a night when the moon offers not less than 25 % illumination and is at least 30 degrees above the horizon

# SOURCES OF AMBIENT LIGHT

- BACKGROUND LIGHTING
- ARTIFICIAL LIGHTS
- SOLAR LIGHTS

# DETERMINING SPEED

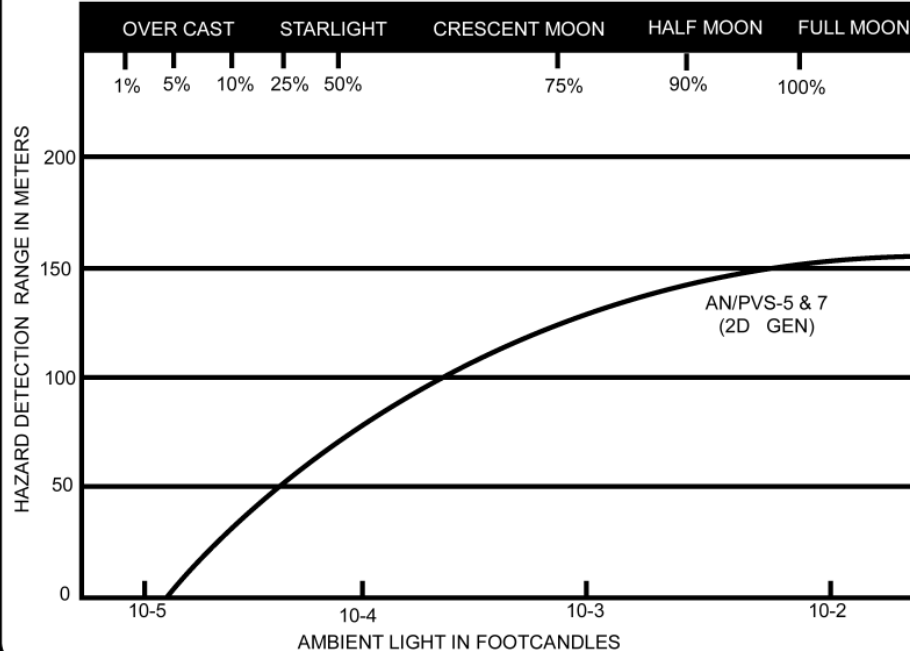
- Type of vehicle
- Weather conditions
- Mode of driving, such as convoy, off-road, and cross-country
- Terrain
- Amount of light available
- Experience of soldiers

# Hazard Range Limitation Graph

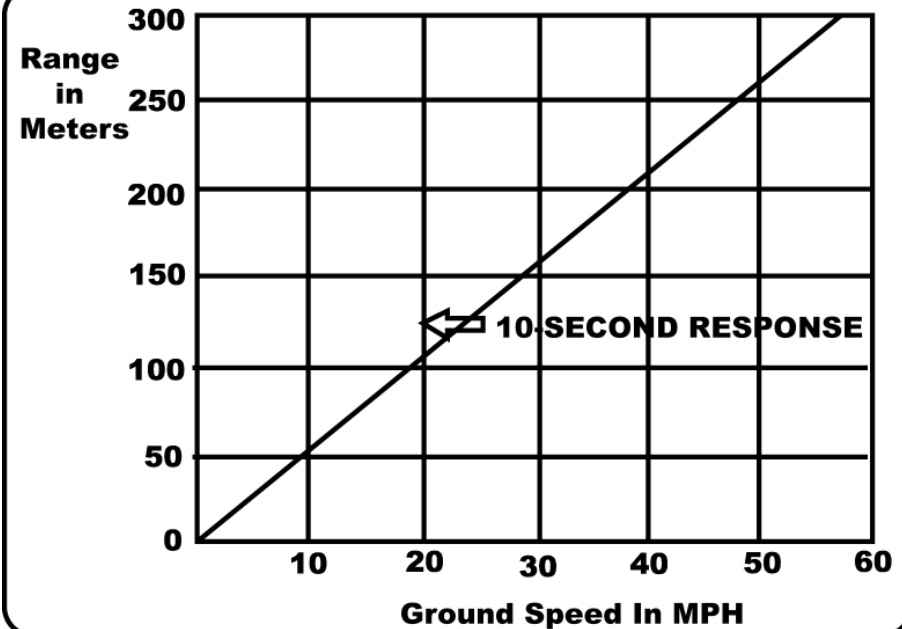
## Ground Speed limitations

**Hazard Range Limitation Graph**

**PERCENTAGE OF MOON ILLUMINATION**



**Ground Speed Limitations**



# NIGHT CONVOYS

- Night moves are basically planned the same way as day moves
- The main difference is the high degree of coordination needed for the night convoy
- Things to remember are:
  - Keep night convoys small
  - Use roads the drivers are familiar with
  - Dim your dash lights

## NIGHT CONVOYS (cont'd)

- Increase recovery capability
- Avoid eye contact with bright lights
- Allow 30-45 minutes to reach maximum dark adaptation
- Don't smoke



# NIGHT CONVOYS

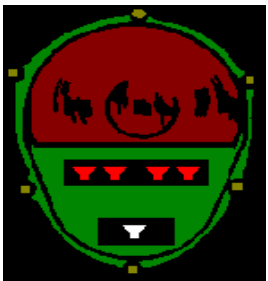
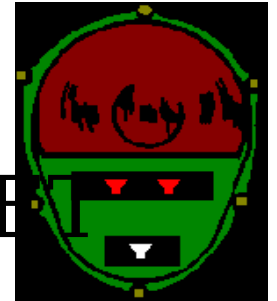
## BLACKOUT DRIVE REAR



MORE THAN 180 FEET



BETWEEN 60 & 180 FEET

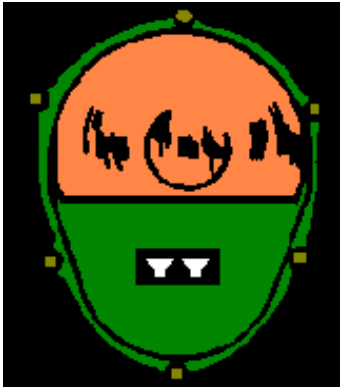


LESS THAN 60 FEET

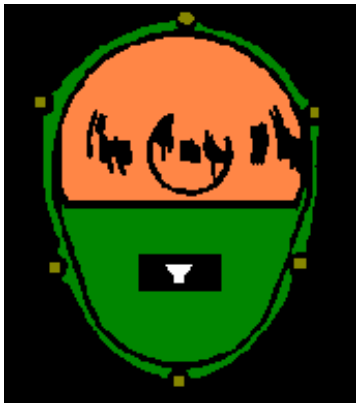
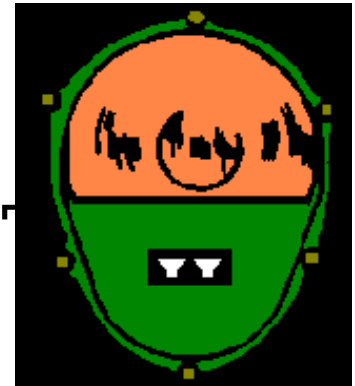


# NIGHT CONVOYS

## BLACKOUT DRIVE FRONT



LESS THAN 60 FEET



BETWEEN 60 & 180 FEET



# NIGHT CONVOYS

## LIGHT SWITCH



# NIGHT CONVOYS

## QUESTION

Front and rear vehicles in a march column, serial, and unit will?

- a. Carry a convoy sign
- b. Carry a convoy flag
- c. Operate their 4-way flashers
- d. All of the above

# NIGHT CONVOYS

## QUESTION

If you see two red lights illuminating from each of the rear blackout markers on the vehicle in front of you, while operating in a night convoy you are?

- a. Too close
- b. The correct distance
- c. Too far away

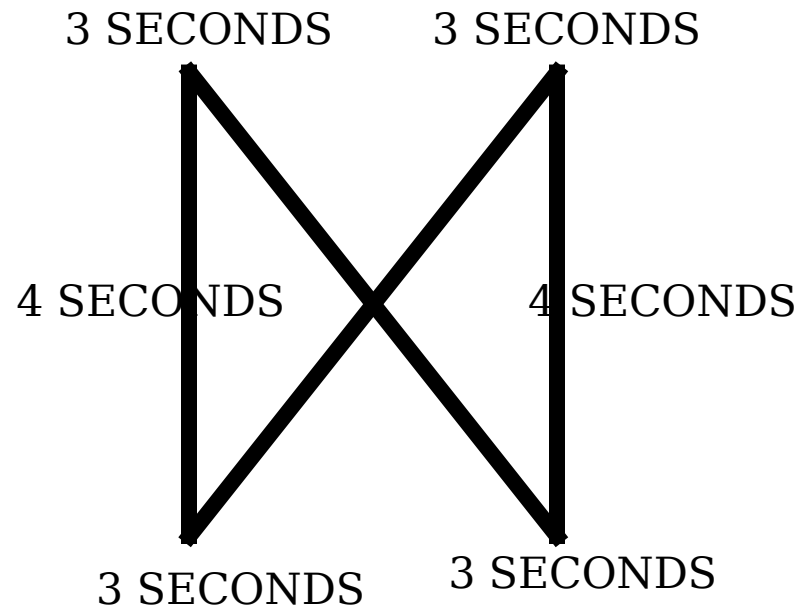
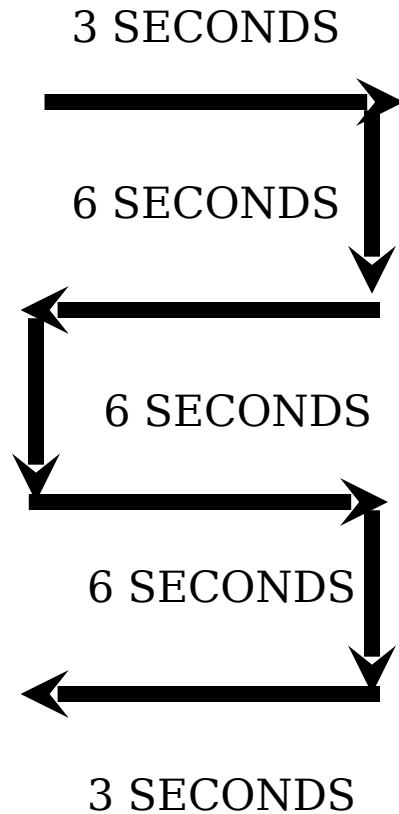
# NIGHT CONVOYS

## QUESTION

A white light illuminating from each of the rear blackout markers on the vehicle in front of you, while operating in a night convoy, tells you to?

- a. Slow down
- b. Stop
- c. Speed up
- d. Everything is OK

# NIGHT VISION SCANNING TECHNIQUES



# CAUSES OF EMERGENCIES

- Overconfidence
- Exposure to bright light
- Vehicle or goggle malfunction
- Batteries go dead
- NBC environment



# CAUSES OF EMERGENCIES

## **OVERCONFIDENCE**

- Overconfidence is a main fault associated with NVG use
- The ability to drive with NVG's is developed through training

# CAUSES OF EMERGENCIES

## **EXPOSURE TO A BRIGHT LIGHT**

- If you are exposed to a bright light source while operating a vehicle and using NVG's
- Slow down and look away from light source
- Pull off the road and warn other vehicles

# CAUSES OF EMERGENCIES

## **VEHICLE OR GOGGLE MALFUNCTION**

- If your vehicle or goggle malfunctions
- Slow down and pull off the road
- Replace batteries when the battery indicator turns on
- DO NOT wait until the goggles shut down while driving due to weak or dead batteries
- DO NOT switch goggles or you will have to refocus the device to suit your eyesight

# CAUSES OF EMERGENCIES

## NBC ENVIRONMENT

- **DO NOT** operate a vehicle while wearing NVG's and a protective mask unless you are in an emergency situation
- Your field of view is reduced another 20 % or 8 degrees

# NIGHT VISION GOGGLE DRIVING OPERATIONS

## **Phase I:**

**Drive a vehicle on a designated route in *DAYLIGHT* conditions.**

## **Phase II:**

**Drive a vehicle on a designated route at night with vehicle headlights on (without NVGs).**

## **Phase III:**

- **Perform pre-operational NVG procedures.**
- **Perform vehicle PMCS (before OP) while wearing NVG.**
- **Drive a designated route at night with NVGs.**
- **Identify signs, route markings, ditches, etc.**
- **Perform post-operational NVG procedures.**
- **Perform vehicle PMCS (after OP) while wearing NVGs.**

# DRIVER RESPONSIBILITY

- Get plenty of rest
- Stay fit
- PMCS
- Know your route
- Focus NVG's for outside of the cab
- Maintain proper following distance (at least 10 seconds).
- Know emergency procedures.
- Always communicate

## ASSISTANT DRIVER RESPONSIBILITY

- Stay fit and get plenty of rest
- PMCS
- Know the route
- Focus NVG's for inside and out side of the cab  
“alternating”
- Know emergency procedures.
- Always communicate.

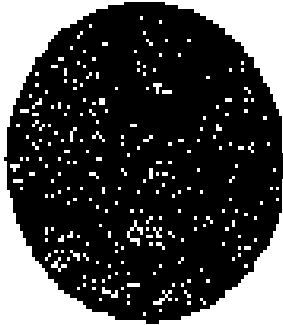
## ACCOUNTABILITY AND SECURITY

- Night vision goggles are considered a sensitive item and are inventoried monthly
- Night vision goggles will be kept in a secure area such as an arms room or company safe
- When being used, night vision goggles will be accounted for by using a DA Form 2062 or DA Form 3161

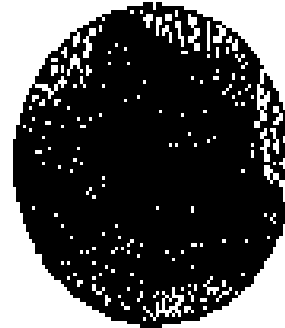


# TUBE DEFECTS

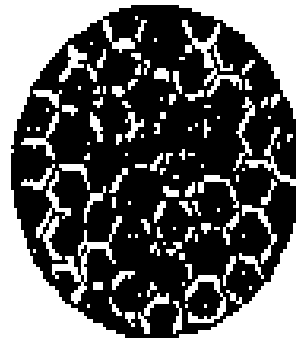
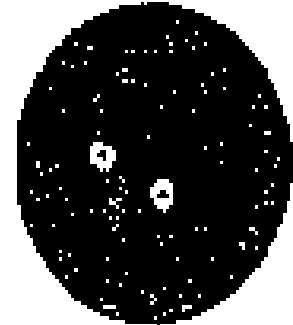
SHADING



EDGE GLOW



WHITE SPOTS

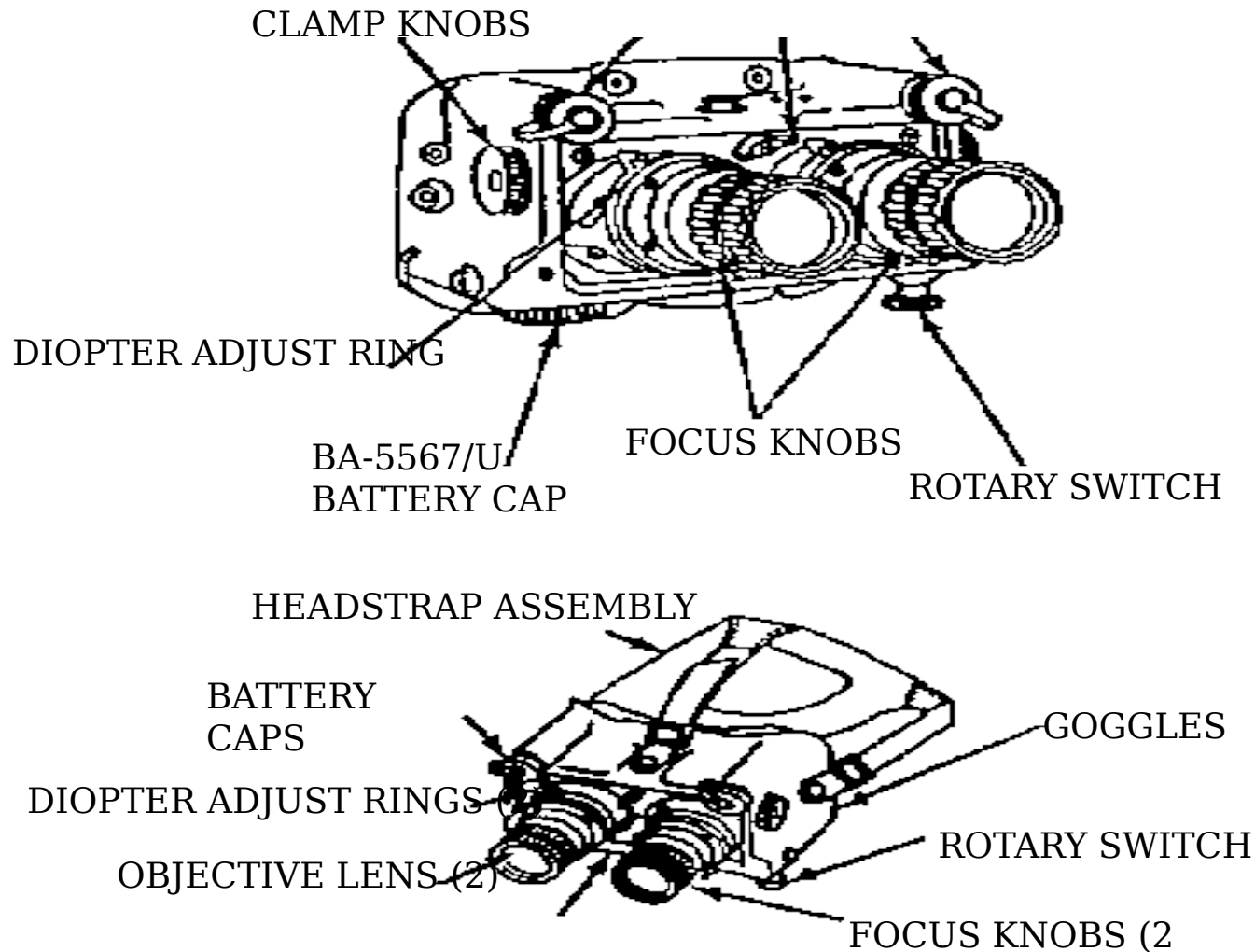


FIXED PATTERN, HONEY COMB

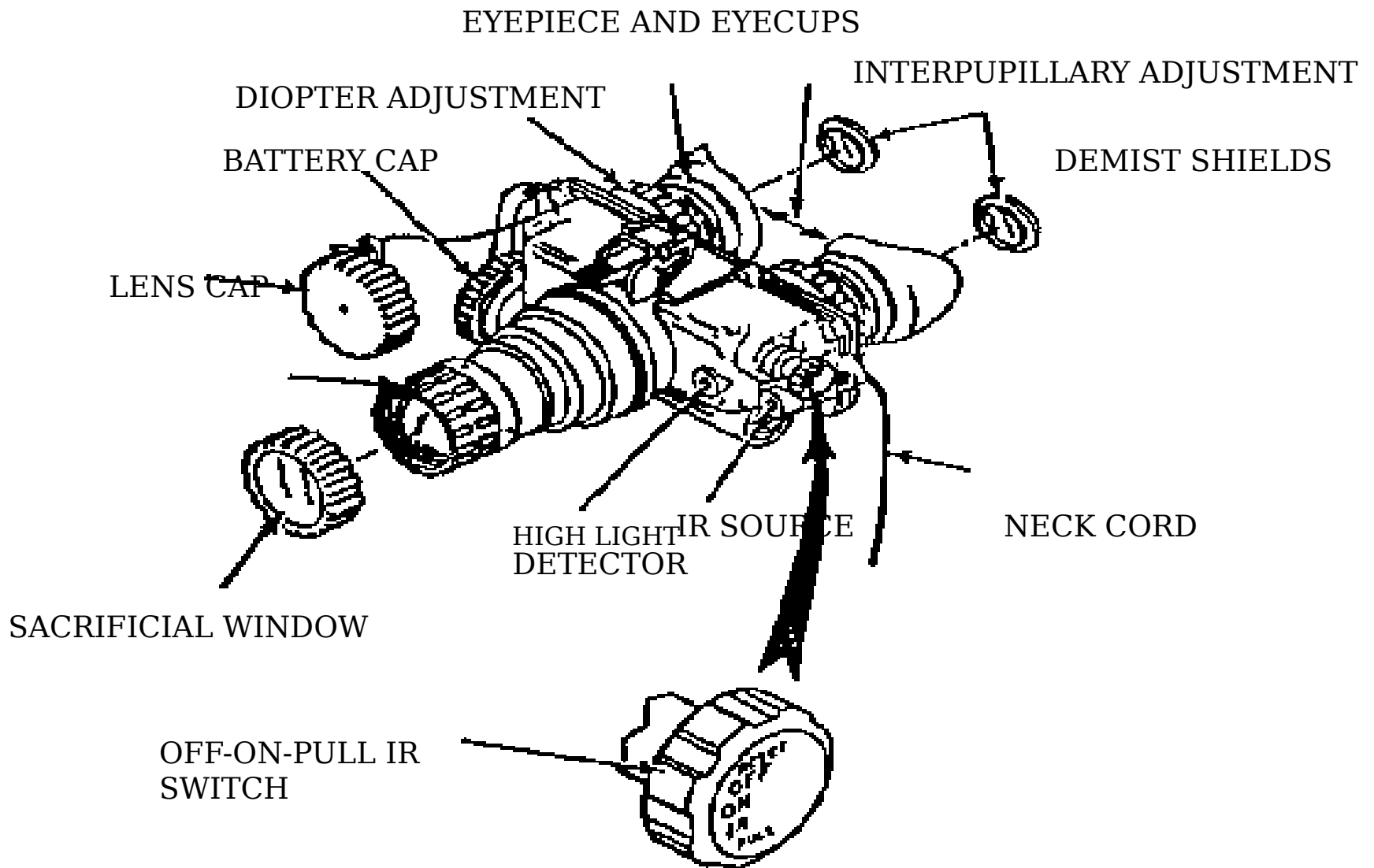


DARK SPOTS

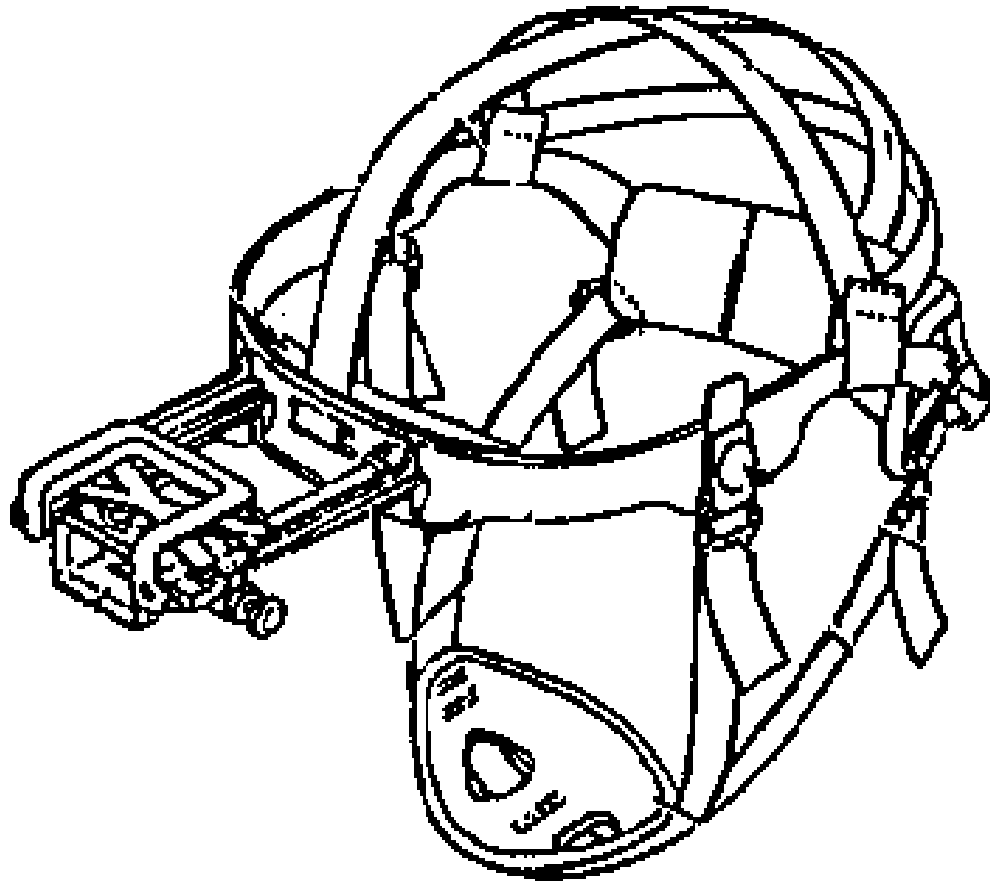
# AN/PVS 5C



# AN/PVS 7B



# HARNESS ASSEMBLY



# QUESTIONS

